Name: KEY TP: _____

Failure to show all work will result in a LaSalle.

Review 9.7-10.5 & Application Problems

Due Wednesday, January 30th

Honors Geometry

1) If $f(x) = x^2 - x$, and $g(x) = \sqrt{x}$, then $f(f(4)) = ?$

$f(4) = 12$

$f(12) = 132$

2) If $f(x) = x + 4$ and $g(x) = 3x - 2$ then $(f \circ g(2)) =$

$g(2) = 4$

$f(4) = 8$

3) If $f(x) = 4 - x$ and $g(x) = 6x + 11$, then $g(f(0)) = ?$

$f(0) = 4$

$g(4) = 35$

4) If $(f \circ g)(x) = \sqrt{x^2 + 1}$, what are the possible value of $f(x)$ and $g(x)$?

$g(x)$ = radicand (1st)

$f(x)$ = radical (2nd)

A. $f(x) = \sqrt{x+1}$; $g(x) = x^2$

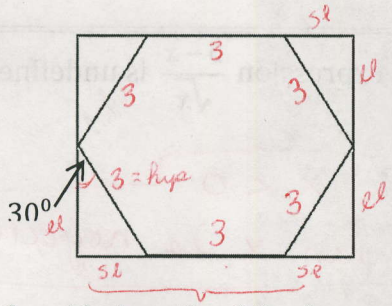
B. $f(x) = \sqrt{x}$; $g(x) = x^2 + 1$

C. $f(x) = \sqrt{x-1}$; $g(x) = x^2 + 2$

D. All of the above are valid.

E. A and B only

5) **HEXAGONS** A box of chocolates shaped like a regular hexagon is placed snugly inside of a rectangular box as shown in the figure.



If the side length of the hexagon is 3 inches, what are the dimensions of the rectangular box?

$3 = sl * 2$

$sl = 1.5$ or $3/2$

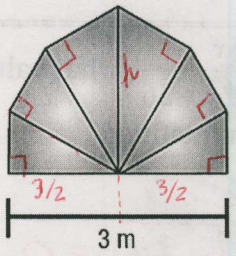
$ll = (3/2)\sqrt{3} = \frac{3\sqrt{3}}{2}$

$3/2 + 3 + 3/2 = 6$

$\frac{3\sqrt{3}}{2} + \frac{3\sqrt{3}}{2} = 3\sqrt{3}$

Dimen: $6 \times 3\sqrt{3}$

6) **WINDOWS** A large stained glass window is constructed from six 30°-60°-90° triangles as shown in the figure.



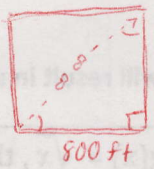
What is the height of the window?

$ll = \frac{3/2}{\sqrt{3}} = \frac{sl\sqrt{3}}{\sqrt{3}}$; $sl = \frac{3\sqrt{3}}{6} = \frac{\sqrt{3}}{2}$

$hyp = 2(sl) = 2(\sqrt{3}/2) = \sqrt{3}$

height $= \sqrt{3} \approx 1.73$ m

7) **Extended Problem Solving** There is a park in your town that is a square with a side length of 800 feet. You plan to walk from one corner of the square to the opposite corner.



a. Compare To the nearest foot, how much shorter is the distance from one corner to the opposite corner along the diagonal than the distance along two sides of the square? $1600 - 1132 =$ 468 ft shorter

Walking the side lengths is $800\text{ft} + 800\text{ft} = 1600\text{ft}$

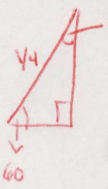
Walking diagonal is $800\sqrt{2} = 1131.37\text{ft} \approx 1132\text{ft}$

b. You walk at a rate of 3 miles per hour. Find your rate in feet per second. $\frac{3\text{ mi}}{1\text{ hr}} \times \frac{5280\text{ ft}}{1\text{ mi}} \times \frac{1\text{ hr}}{60\text{ min}} \times \frac{1\text{ min}}{60\text{ sec}} = \frac{4.4\text{ ft}}{\text{sec}}$

c. Interpret To the nearest second, how much time would you save by walking along the diagonal rather than walking along two sides of the square? $\frac{468\text{ft}}{1} \times \frac{1\text{ sec}}{4.4\text{ft}} = 106.3 \approx$ 107 seconds or 1 min 47 seconds

1 mi = 5280 ft.

8) **Wrenches** You must choose the right size wrench to tighten a nut. Each edge of the nut has a length of $\frac{1}{4}$ inch. You should choose a wrench size that is close to the distance across the nut from one edge to the opposite edge. Which wrench size should you use, $\frac{3}{8}$ inch, $\frac{7}{16}$ inch, or $\frac{1}{2}$ inch?



$\text{Hyp} = \frac{1/4}{2} = \frac{2(sl)}{2}$

$1/8 = sl$

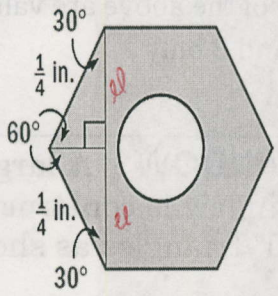
$ll = sl\sqrt{3} = \frac{\sqrt{3}}{8}$

convert to decimal

$7/16 = .4375$

$3/8 = .375$

$1/2 = .5$



After comparing Distance across $= 2(ll)$ $= 2(\sqrt{3}/8) \approx .433$ in

Wrench 7/16, because it is the closes ~~m~~ match to the distance across the nut, which is .433 inches.

9) Given $\frac{5x}{x^2 + 12x + 36}$, what value(s) of **x** will make the expression undefined?

$\frac{5x}{(x+6)(x+6)} = 0$

$x \neq -6$ or else the function will be undefined.

10) The expression $\frac{5 - x}{\sqrt{x}}$ is undefined when x is:

$x < 0$ when x is negative

11) If x is a real number, and the value of $\frac{x}{x+5}$ is undefined, what is the value of x + 8?

$x+5=0 \quad x=-5$

$-5+8=\boxed{3}$

12) What is the product of the values that make the following expression undefined?

$\frac{4}{z^2+9z+14}$

$(z+2)(z+7)=0$

$z=-7,-2$

$(-7)(-2)=\boxed{14}$

13) If g(x) = 3x – 1 and f(x) = x^2 + 1, compute f ∘ g(x).

$f(3x-1)=(3x-1)^2+1$

$\boxed{9x^2-6x+3}$

14) Compute $(g \circ f)(x)$ using the functions $f(x)=x^2+1$ and $g(x)=2x-5$

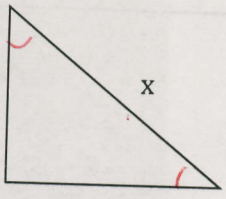
$g(x^2+1)=2(x^2+1)-5$

$\boxed{2x^2-3}$

15) In a 30° – 60° – 90° triangle, how many times larger is the larger leg than the shorter leg?

The larger leg is $\sqrt{3}$ times larger than the shorter leg. ☺

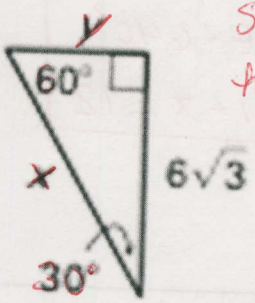
16) Find the length of side x in the isosceles right triangle below.



$\boxed{x=12\sqrt{2}\text{ ft}}$

45, 45, 90 △

17) Find x and y.



ll = $6\sqrt{3}$

sl = y = $\boxed{6}$

hyp = x = 2(6) = $\boxed{12}$

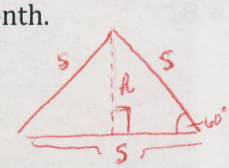
18) In a 45°-45°-90° triangle, the hypotenuse is $\sqrt{2}$ times as long as each leg.

19) If two angles of one triangle are congruent to two angles of another triangle, then the triangles are _____.

Similar.

Angle Angle Similarity Postulate.

20) The perimeter of an equilateral triangle is 36 inches. Find the **area** of the equilateral. Round to the nearest tenth.



$\frac{3s}{3} = \frac{36}{3}$ $\boxed{s = 12 \text{ in}}$

$h = ll = sl\sqrt{3} = 6\sqrt{3}$

$sl = 6$

Area $= (1/2)(b)(h)$

$= (1/2)(12)(6\sqrt{3})$

$\boxed{\approx 62.4 \text{ inches}^2}$

For problems #21-26, use the table definitions of H(t) and r(t) shown below to find the indicated value.

t	1.0	1.5	2.0	2.5	3.0	3.5
$H(t)$	2.8	2.6	2.5	2.0	1.0	2.2

t	2.0	2.2	2.4	2.6	2.8	3.0
$r(t)$	1.2	1.5	3.0	2.8	2.5	2.0

21) $(r \circ H)(2.5)$

$r(2.0) = \boxed{1.2}$

22) $(r \circ H)(1.0)$

$r(2.8) = \boxed{2.5}$

23) $(H \circ r)(2.2)$

$H(1.5) = \boxed{2.6}$

24) $(H \circ r)(3.0)$

$r(3.0) = 2.0$

$H(2.0) = \boxed{2.5}$

25) $(H \circ H)(2.0)$

$H(2.5) = \boxed{2.0}$

26) $(r \circ r)(2.4)$

$r(3.0) = \boxed{2.0}$

27) A toy manufacturer has a new product to sell. The number of units to be sold, **x**, is a function of the price, p in the equation x(p) = 30 – 25p. The revenue earned is a function of the number of units sold: r(x) = 1000 – 0.25x2. **Find the function for revenue, r, in terms of the price, p.**

$r(x(p)) = 1000 - .25(30 - 25p)^2$

$= 1000 - .25(900 - 1400p + 625p^2)$

$= 1000 - 255 - 350p + 156.25p^2$

$= 775 - 350p + 156.25p^2$

28) The number of cars N (per day) produced at a factory after t hours of operation is given by N(t) = 100t – 5t2 where t varies from 0 to 10. If the cost C (in dollars) of producing N cars is C(N) = 15000 + 8000N, **find the cost as a function of time.**

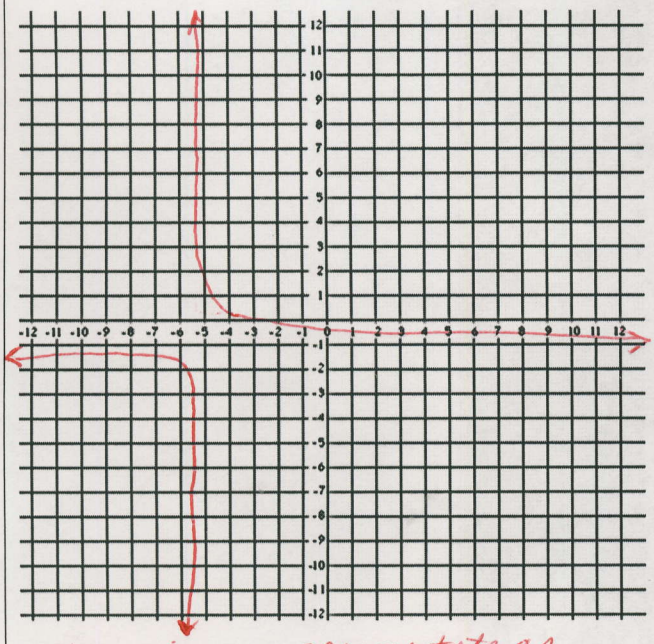
New Question:

$\boxed{C(x) = 67 + 320t - 64t^2 \quad \text{where } 1 < t \leq 12}$

29) Graph the following function and describe what happens at the excluded values.

$$\frac{2-x}{3x+16}$$

$x \neq -\frac{16}{3} \approx -5.33$



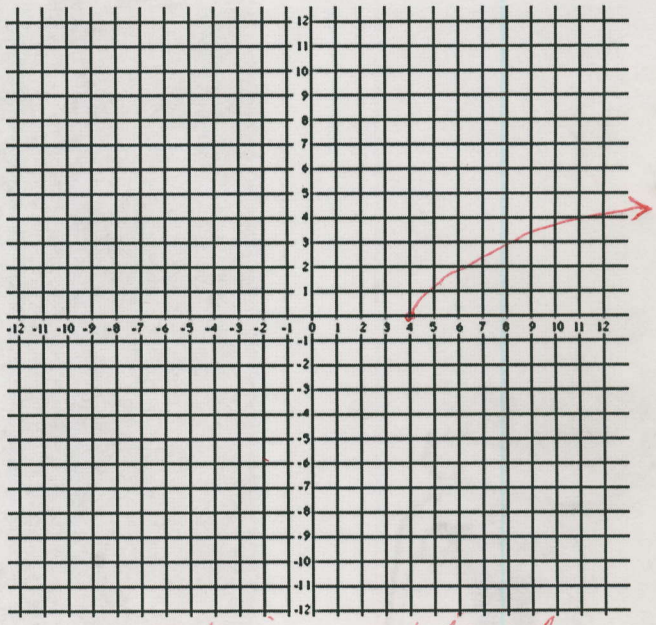
There is an asymptote at $x = -16/3$

30) Graph the following function and describe what happens at the excluded values.

$$\sqrt{3x-12}$$

$x < \frac{12}{3}$

$x < 4$



The graph is undefined for all x values less than 4.

31) The regular price of a microwave in x dollars. Using a \$5 off coupon makes the price $f(x) = x - 5$. A 40% off sale makes the price $g(x) = 0.6 \cdot x$. Which composite function represents the better deal?

Test both hypotheses with a number; ex: let $x = 100$.

A. $(f \circ g)(x)$ – First take off \$5, then take off 40%

B. $(g \circ f)(x)$ – First take off \$5, then take off 40%

C. $(f \circ g)(x)$ – First take off 40%, then take off \$5

D. $(g \circ f)(x)$ – First take off 40%, then take off \$5